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The Effects of the Moleculetor Fuel Energizer on Emissions and Fuel Economy

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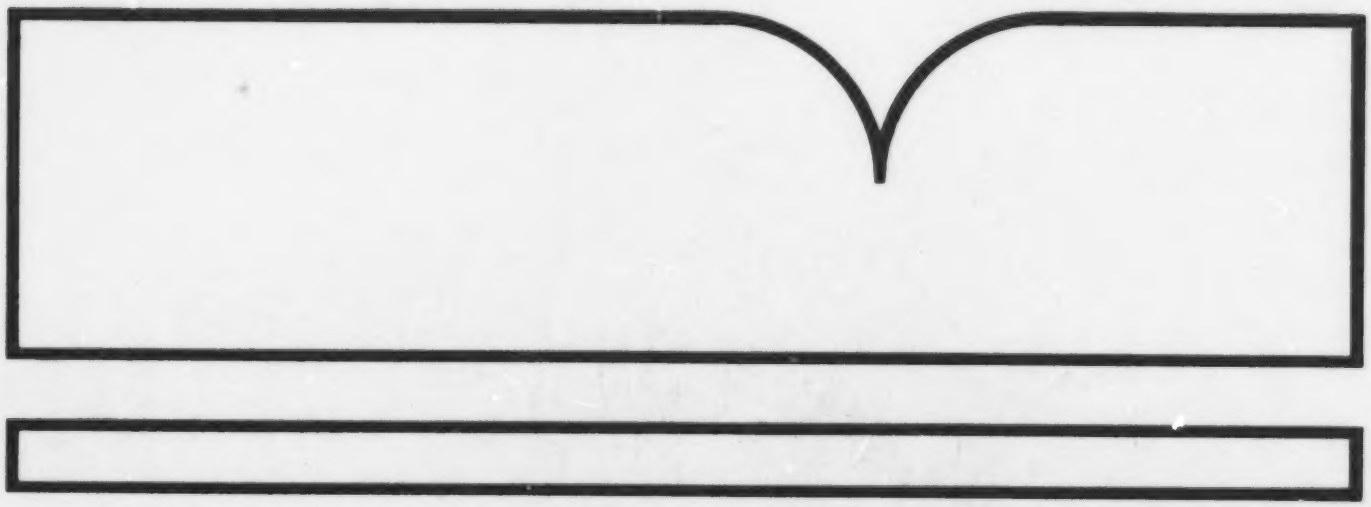

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Based on the results of this testing, there is no reason to believe that the Moleculetor conclusively had an effect on the fuel economy and emission levels of the test vehicles. The changes that were shown were quite small and were not inconsistent with trends found by EPA on other fleets of test vehicles which were subjected to mileage accumulation.

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Test and Evaluation Branch
Emission Control Technology Division
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Abstract

This paper describes a program designed to evaluate the effects of the Moleculetor Fuel Energizer on exhaust emissions and fuel economy. Three late model passenger cars were subjected to a series of test sequences both before and after installation of the device. Each test sequence included the current Federal Test Procedure (for exhaust emissions only) and the Highway Fuel Economy Test. Test vehicles were selected on the basis of high sales volume and were set to manufacturer's specifications before entering the program.

Based on the results of this testing, there is no reason to believe that the Moleculetor conclusively had an effect on the fuel economy and emission levels of the test vehicles. The changes that were shown were quite small and were not inconsistent with trends found by EPA on other fleets of test vehicles which were subjected to mileage accumulation.

Background

The Environmental Protection Agency receives information about many devices which appear to offer potential for emissions reduction and/or fuel economy improvement on conventional engines and vehicles. EPA invites developers of such devices to apply for a "Section 511 Evaluation". Section 511 of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 2011) requires EPA to evaluate fuel economy retrofit devices with regard to both emissions and fuel economy, and to publish the results in the Federal Register. The applicant must provide complete technical data on the device, principles of operation, and results of emissions and fuel economy tests. Should the application indicate that the device shows promise, confirmatory testing will be conducted by the EPA at its Motor Vehicle Emission Laboratory in Ann Arbor, Michigan. The results of such test projects are set forth in a series of reports by the Test and Evaluation Branch.

EPA received a 511 application, dated March 24, 1980, from Energy Efficiencies, Inc. (EEI) to perform an evaluation of their Fuel Energizer Moleculetor (hereafter referred to as Moleculetor). The Moleculetor is a cylinder of aluminum approximately 1.5 inches in diameter. Several models in different lengths are offered for various applications. There is a hole drilled length-wise through the center with a brass fitting on each end. The Moleculetor is installed into the fuel line between the fuel tank and fuel pump. According to the instructions, the installation takes 15 to 20 minutes once the proper location has been found. The manufacturer claims that the aluminum serves as a container for an induced "energy field". The energy field supposedly changes the molecular structure of the fuel as it passes through the device and causes it to burn more efficiently. According to the manufacturer, maximum efficiency is reached after 500 miles of driving. According to advertisements for the Moleculetor, fuel economy improvements from 10% to 23% can be expected. In the 511 application, it was stated that significant emission reductions were displayed by all cars that were tested for their support data. No claims were made on changes in driveability. EEI supplied two reports by Olson Engineering, Inc. as the main body of their support data. Also supplied were three magazine articles, and testimonials by individuals describing their experience with the Moleculetor.

Purpose of EPA Program

The purpose of this program was to evaluate the effects of the Moleculetor on fuel economy and regulated emissions. Judging from the preliminary examination of the device itself, the claims concerning the ease of installation and the lack of required maintenance seem to be correct. The claim that vehicle safety would not be affected also seems correct as long as the device was installed properly. Thus, these aspects of the device were not part of the EPA test program.

Test Plan

The following test plan was developed to address the claims made for the Moleculetor.

1. Identify and obtain three test vehicles - Typical, current in-use passenger cars were sought. Only vehicles with between 10,000 and 20,000 miles were to be obtained. The original candidates were: Chevette, Citation, Fairmont, Cutlass, and Omni.

2. Conduct underhood inspection and perform minor adjustments - These checks and adjustments were to ensure that the cars were operating in accordance with the manufacturer's tune-up specifications.

3. Perform first Road Route sequence - The first sequence was to consist of a mileage accumulation route, approximately 130 miles in length. Since the test vehicle would be a rental car of unknown prior use, this sequence would assure that each vehicle was reasonably preconditioned.

4. Perform dynamometer test sequences - This sequence was to include the Federal Test Procedure (exhaust emissions only) and the Highway Fuel Economy Test. They were to be performed at least twice at each test point or as many times as necessary to obtain stable results. Values for HC, CO, CO_2, NOx and fuel economy were to be measured.

5. Install Moleculetor - This was to be performed once all baseline testing was complete.

6. Perform second Road Route sequence - This sequence was to consist of four mileage accumulation routes, totaling over 500 miles. This amount of mileage was specified by the Applicant to be necessary for full "energization" of the vehicle.

7. Perform dynamometer test sequence with Moleculetor - This was to be performed in the same manner as that in Step 4.

8. Assemble results and complete report.

This test plan was submitted to and approved by EEI. At this time, they also appointed a representative to oversee the test program and provide technical assistance. The test vehicles were then procured from local rental agencies. They were as follows:

A 1979 Chevrolet Chevette with a 1.6 liter four cylinder engine, two barrel carburetor, and an automatic transmission.

A 1980 Chevrolet Citation with a 2.8 liter six cylinder engine, two barrel carburetor, and an automatic transmission.

A 1980 Ford Fairmont with a 3.3 liter six cylinder engine, one barrel carburetor, and an automatic transmission.

These test vehicles were selected on the basis of sales. They represented the top three domestic nameplates in registrations for 1980. Even though the Chevrolet Chevette was a 1979 model, its ranking in sales was similar to the 1980 models.

There were four mileage accumulation road routes used in this program that ranged from 127 miles to 153 miles in length. Each requires 3 to 3 1/2 hours for an average speed of approximately 45 mph. They were developed and used in earlier EPA programs. They consist of mostly two lane rural roads, but all have some highway and city type driving. A description of the road routes is attached in Appendix A.

The dynamometer testing was conducted according to the Federal Test Procedure (FTP) described in the Federal Register of June 28, 1977 and the Highway Fuel Economy Test (HFET) described in the Federal Register of September 10, 1977.

Conduct of the Test Program

The time interval for the dynamometer testing portion of this program ran from November, 1980 to March, 1981. This was longer than originally planned because numerous delays prolonged the program. After sucessful underhood inspections were performed on the test vehicles the first road route sequence was performed without incident. Following this the baseline testing began. Although the Chevette and Citation completed this phase without problems, the Fairmont displayed an apparent erratic malfunction in the charging system. The alternator warning light would blink off and on intermittently during the baseline tests. Nothing was done to correct the problem at that time. Finally, after installation of the Moleculetor, the charging system completely failed during the second road route mileage accumulation sequence. The Fairmont was towed back to the laboratory and the malfunction was traced to the voltage regulator. After the installation of a new regulator, the Fairmont continued mileage accumulation. The decision at this time was to continue testing on the Fairmont even though changes to the vehicle had been made. The vehicle could not be rebaselined because the Moleculetor had already been installed. According to the manufacturer's claims, this energizes the entire fuel system and takes 56 days to de-energize after removal. The other two vehicles completed the road route sequences without incident.

Upon beginning the second series of dynamometer tests, the Fairmont began to display erratic test results. After the dynamometer testing was completed, the decision was made to acquire an identical Fairmont to replace the original one. A replacement Fairmont was obtained, but proved to be somewhat erratic in its baseline data. Six sequences were run before an acceptable baseline was established. The replacement Fairmont then completed the rest of the test procedure. Because of the problems encountered with the original Fairmont, it was decided to perform further testing after the removal of the Moleculetor. The results obtained from this vehicle are not included in the averages. However, all individual data generated from this and the other test vehicles can be found in Appendix B.

There was one additional change in the original test plan. Rather than conducting the program using commercial fuel, Indolene Clear was used. This fuel is used throughout EPA and the automotive industry as the standard for emissions and fuel economy testing. Its specifications are well established and tightly controlled. The use of commercial gasoline would have required drum storage or frequent purchases from local gas stations. The former situation was discouraged on the basis of safety while the latter was unacceptable because of the variability in fuel properties and quality. These reasons for the fuel change in the original test plan were approved by EEI. Most other test variables were also minimized through the use of the same driver for each car and the same test cell throughout the program.

Test Results

Shown in Table 1 are the average baseline and "Moleculetor installed" FTP emission and fuel economy results for the test vehicles.

Table 1
Average FTP Emissions and Fuel Economy
(Emission values in grams/mile)

Vehicle	Test	Number of Tests	HC	CO	CO_2	NOx	MPG
Citation	Baseline	2	.47	4.00	427	1.55	20.40
	Moleculetor	2	.44	3.64	417	1.74	20.95
Chevette	Baseline	3	.60	6.20	348	1.50	24.70
	Moleculetor	3	.66	7.17	352	1.48	24.27
Fairmont	Baseline	6	.59	6.23	460	1.73	18.80
	Moleculetor	5	.61	6.42	443	2.02	19.50

As these results show, there were slight variances in the fuel economy data. The Citation displayed a 3% increase, the Chevette a 2% decrease, and the Fairmont a 4% increase. Overall, this amounts to approximately a 2% average improvement. Typically, test-to-test variability in fuel economy measurements for "back-to-back" testing is in the range of 1-3%. This range can be expected to expand slightly due to equipment and vehicle changes if time or mileage occurs between the tests as required in this evaluation program. Thus, when test variability is taken into account, these changes are negligible. The emission levels also remained fairly stable with the exception of NOx on the Fairmont which increased 17%.

Table 2 displays the average HFET emission and fuel economy results.

Table 2
Average HFET Emissions and Fuel Economy
(Emission values in grams/mile)

Vehicle	Test	Number of Tests	HC	CO	CO_2	NOx	MPG
Citation	Baseline	2	.11	.49	299	1.50	29.55
	Moleculetor	3	.10	.56	284	1.49	31.10
Chevette	Baseline	3	.13	.57	274	1.75	32.20
	Moleculetor	2	.12	.50	278	1.75	31.85
Fairmont	Baseline	6	.13	.06	366	1.50	24.18
	Moleculetor	5	.15	.03	348	1.57	25.48

As with the FTP, the HFET fuel economy varied on both the plus and minus side. The Citation and the Fairmont both displayed a 5% increase, while the Chevette decreased 1%. Overall, a 3% improvement was measured. The emission values displayed very little variances between the baseline and Moleculetor tests.

The original Fairmont which was subsequently disqualified showed marked increases in the FTP and HFET test numbers after the Moleculetor was installed and 500 miles of on-the-road driving was performed. Both fuel economy and emissions had changed significantly from the baseline tests. Further testing after removal of the Moleculetor showed the same trend continuing. In fact, the final test (seven weeks after removal) displayed the highest fuel economy of any of the preceding tests performed on it. Complete test data can be found in Appendix B.

Analysis of Results

After assembling the results, two statistical tests were performed. The first was the one-sided t-test at a 95% confidence level. This test was performed on individual vehicles. It showed a statistically significant increase in fuel economy for the Fairmont over both the FTP and HFET. The HFET fuel economy increase for the Citation was also found to be significant. Using this same technique, no statistically significant changes were observed for either test on the Chevette, or for the FTP on the Citation. The other statistical test was the univariate 1-way ANOVA. In this test, results from all three cars were standardized and grouped. The increases in NOx emissions and the HFET fuel economy for the fleet were deemed statistically significant by this method.

Appendix A

Description of Road Routes Used for Mileage Accumulation

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#1 Adrian Road Route

(130 miles, about 3 hours)

Location	Route	Miles	Approx. Time hr:min
EPA	Start at EPA Parking Area	0.0	0:00
	EPA to Plymouth Road (turn left)		
	Plymouth Road to US-23 (North) (turn left onto ramp)		
	US-23 to M-14 (West) (follow expressway to left twice)		
	M-14 to I-94 (West) (merge)	10.1	0:17
Jackson	I-94 to US-127 (South) (exit right, clover-leaf)	38.8	0:50
	continue on US-127 when expressway ends	45.2	1:00
Hudson	US-127 to M-34 (East) (turn left)	69.0	1:28
Adrian	M-34 to M-52 (North) (turn left)	86.2	1:50
	Follow M-52 through Adrian (3 to 4 turns)	100.8	2:12
	M-52 to M-12 (turn right)		
Saline	M-12 to Ann Arbor-Saline Road (turn left)	115.0	2:30
	At Wagner Road, continue on Ann Arbor-Saline Road at STOP sign (veer right)		
Ann Arbor	Ann Arbor-Saline Road turns into Main Street (straight)		
	Main Street to Stadium Blvd. (turn right)	122.8	2:43
	Stadium runs into Washtenaw (merge)		
	Washtenaw to Huron Parkway (turn left)	125.6	2:51
	Huron Parkway to Plymouth Road (turn left)		
	Plymouth Road to EPA		
EPA	Finish at EPA Parking Area	129.5	3:00

#2 - Ohio Road Route

(133 miles, about 3 hours)

Location	Route	Miles
EPA	Start at EPA Parking Lot	0.0
	EPA to Plymouth Road (turn left)	
	Plymouth Road to US-23 (South) (turn right, enter ramp)	
Toledo, Ohio	US-23 to SR-2 in Ohio (West) (exit right)	48.8
	SR-2 (West) to SR-109 (North) (turn right)	66.7
Ann Arbor, MI	SR-109 turns into M-52 at Michigan border (straight)	76.3
	M-52, through Adrian, to M-50 (East) (turn right)	96.8
	M-50 to Ridge Highway (turn left)	104.1
	Ridge Highway to Mooreville Road (turn right)	113.7
	Mooreville Road to Stony Creek (turn left)	114.2
	Stony Creek to Carpenter Road (turn left)	117.7
	Carpenter Road turns to Hogback at Washtenaw (straight)	125.8
	Hogback Road turns into Huron River Drive (straight)	
	Huron River Drive to Dixboro Road (turn left)	127.0
	Dixboro to Plymouth Road (turn left)	
	Plymouth Road to EPA (turn right)	
EPA	Finish at EPA Parking Lot	132.7

#3 - Ann Arbor Road Route

(153 miles, 3-1/2 to 4 hours)

Location	Route	Miles	Time hr:min
EPA	Start at EPA Parking Lot	0.0	0:00
	EPA to Plymouth Road (left turn)		
	Plymouth Road to Ford Road (right turn)		
	Ford Road to Prospect (right turn)	6.0	0:09
Ypsilanti	Prospect to Forest (right turn)	11.0	0:17
	Forest to Hamilton (left turn)	12.0	
	Hamilton through Ypsilanti & over I-94		
	Hamilton changes to Whittaker		
	Whittaker to Milan-Oakville Road (right turn)	23.0	0:36
Milan	Milan-Oakville Road to Main (veer right)		
	Main, through Milan, to Saline-Milan Road (right turn)	30.0	0:45
Saline	Saline-Milan Road to Michigan Ave. (left turn)	35.0	0:55
	Michigan Ave., through Saline, to Austin Road (right turn)	36.0	0:56
Manchester	Austin changes to M-52 in Manchester		
	M-52 to Main (left turn)	50.0	1:13
	Main changes back to Austin Road		
Napoleon	Austin Road to M-50 (straight at STOP sign)		
	M-50 to Napoleon Road (right turn)	62.0	1:29
	Napolean changes to Broad Street (straight at STOP sign on Lee)		
Michigan Center	Broad to Fifth (right turn)	68.0	1:37
	Fifth to Page Ave. (right turn)		
	Page to Ballard Road at TRICO Industries before RR tracks (see map on next page) (left turn)	69.0	1:40
	Ballard to Michigan Road (right turn)	70.0	1:42
Grass Lake	Michigan to Mt. Hope (left turn)	76.0	1:50
	NOTE: Mt. Hope is Union Street on the right side of Michigan Road in Grass Lake		
	Mt. Hope over I-94 to Seymour (right turn)	81.0	1:56
	Seymour turns into Trist (no noticeable turns)		
	Trist to Clear Lake (left turn)	84.0	2:00
	Clear Lake to Waterloo Road (turn right)		
	Waterloo to M-52 (turn right)	91.0	2:10

#3 - Ann Arbor Road Route cont.

Location	Route	Miles	Time hr:min
Chelsea	M-52 to Middle Street at light (left turn)	94.0	2:15
	Middle Street to McKinley (left turn)	94.0	2:16
	McKinley over RR tracks to Dexter-Chelsea Road (right turn)		
Dexter	Dexter-Chelsea Road to Main in Dexter (left turn)	101.0	2:24
	Main, under viaduct, to Dexter-Pinckney (veer right)		
	NOTE: Main changes to Island Lake Road at Dexter-Pinckney Road		
Pinckney	Dexter-Pinckney Road to M-36 (right turn)	110.0	2:38
	M-36 to US-23 (North) (left turn)	121.0	2:54
	US-23 to I-96 (East) (exit right)	127.0	3:01
	I-96 to Milford-New Hudson, Exit 155, to Pontiac Trail (also Milford Road) (exit right, then turn right)	134.0	3:09
New Hudson	Pontiac Trail across Grand River (veer right) continue on Pontiac Trail (see map below)[2]		
	Pontiac Trail turns left at Silver Lake Road (left turn)		
South Lyon	Pontiac Trail through South Lyon		
	Pontiac Trail to Dixboro Road (left turn)	147.0	3:27
	Dixboro Road to Plymouth Road (right turn)	151.0	3:33
	Plymouth Road to EPA (right turn)		
EPA	Finish at EPA Parking Lot	153.0	3:37

#4 - Howell Road Route

(127 miles, 3-1/4 to 3-1/2 hours)

Location	Route	Miles	Time hr:min
EPA	Start at EPA Parking Lot	0.0	0:00
	EPA to Plymouth Road (turn left)		
	Plymouth Road to Ford Road (detour) (turn right)		
	Ford Road to M-153 (West) (turn right, then 180° left turn at island)		
Plymouth	M-153 to Plymouth (finish detour) (right turn)		
	Plymouth Road turns to Ann Arbor Road in Plymouth, also called M-14		
	M-14 (East) to I-275 (North) (right turn onto cloverleaf)	16.2	0:00
	I-275 to I-96 (West) (follow left lane of I-275 straight)		
	I-96 to Novi Exit (Walled Lake) (right turn off exit ramp)	27.0	
	Novi Road to East Lake Drive (right turn)		
	E. Lake Drive to Pontiac Trail (right turn)	30.8	0:45
	Pontiac Trail to South Commerce Road (left turn)	31.6	
	S. Commerce to Oakley Park Road (right turn)	33.7	
	Oakley Park to Newton (left turn)	34.2	
	Newton to Richardson (right turn)	34.5	0:52
	Richardson to Union Lake Road (left turn)	35.7	
	Union Lake to Elizabeth Lake (left turn)	40.5	
	Elizabeth Lake to M-59 (Highland Park) (left turn) (veer left at fork)	42.3	
	M-59, over US-23, past Howell, to I-96 (West) (right turn on ramp)	67.5	
	I-96 to M-52 (South) (exit right, turn left off of ramp)	78.9	1:40
Chelsea	M-52 through Stockbridge to Chelsea		
	M-52 to Middle Road in Chelsea (left turn)	106.8	2:25
	Middle Road to McKinley Street (turn left)		
	McKinley, over RR tracks, to Dexter-Chelsea Rd. (right turn)		
Dexter	Dexter-Chelsea to Main (right turn)	114.0	
	Main to Central (veer left)		
	Central to Huron River Drive (turn right)	114.7	
Ann Arbor	Huron River Drive to N. Main Street (turn right)	123.8	
	Main to Depot Street (left turn)		
	Depot goes under Broadway Bridge then up to Broadway on right lane (right turn, circle 270° right)		

#4 - Howell Road Route cont.

Location	Route	Miles	Time hr:min
A^2 cont.	Broadway to Plymouth (veer left at fork) Plymouth Road to EPA	125.7	
EPA	Finish at EPA Parking Lot	127.1	3:15

Appendix B

Individual Test Results

Moleculetor Fuel Energizer Evaluation

1979 Chevette

FTP Results - Emission values are expressed in grams per mile.

Test Number	Date	Test Condition	HC	CO	CO_2	NOx	MPG
80-6781	11/19/80	Baseline	.62	6.9	351	1.42	24.4
80-6783	11/20/80	Baseline	.57	5.4	346	1.54	24.9
80-6785	11/21/80	Baseline	.61	6.3	346	1.53	24.8
80-6936	12/2/80	Moleculetor	.76	7.8	348	1.39	24.5
80-6938	12/3/80	Moleculetor	.61	6.8	354	1.48	24.2
80-6956	12/4/80	Moleculetor	.60	6.9	355	1.56	24.1

HFET Results - Emission values are expressed in grams per mile.

Test Number	Date	Test Condition	HC	CO	CO_2	NOx	MPG
80-6782	11/19/80	Baseline	.13	0.8	280	1.79	31.5
80-6784	11/20/80	Baseline	.13	0.3	272	1.68	32.5
80-6784	11/21/80	Baseline	.13	0.6	271	1.78	32.6
80-6937	12/2/80	Moleculetor*	.16	1.1	318	2.15	27.7
80-6939	12/3/80	Moleculetor	.12	0.5	276	1.70	32.0
80-6955	12/4/80	Moleculetor	.12	0.5	279	1.80	31.7

*Test voided - results not averaged into summary.

Moleculetor Fuel Energizer Evaluation

1980 Chevrolet Citation

FTP Results - Emission values are expressed in grams per mile.

Test Number	Date	Test Condition	HC	CO	CO_2	NOx	MPG
80-6786	11/18/80	Baseline	.50	3.9	420	1.52	20.7
80-6806	11/19/80	Baseline	.43	4.1	434	1.58	20.1
80-6786	12/2/80	Moleculetor*	.49	4.8	410	1.64	21.2
80-6788	12/3/80	Moleculetor	.43	3.3	416	1.76	21.0
80-6958	12/4/80	Moleculetor	.45	4.0	417	1.72	20.9

*Test voided - results not averaged into summary.

HFET Results - Emission Values are expressed in grams per mile.

Test Number	Date	Test Condition	HC	CO	CO_2	NOx	MPG
80-6809	11/18/80	Baseline	.11	0.5	298	1.50	29.6
80-6807	11/19/80	Baseline	.10	0.5	299	1.49	29.5
80-6787	12/2/80	Moleculetor	.11	0.6	277	1.43	31.9
80-6789	12/3/80	Moleculetor	.10	0.5	291	1.52	30.4
80-6957	12/4/80	Moleculetor	.10	0.6	285	1.53	31.0

Moleculetor Fuel Energizer Evaluation

1980 Ford Fairmont

FTP Results - Emission values are expressed in grams per mile.

Test Number	Date	Test Condition	HC	CO	CO_2	NOx	MPG
80-7262	1/13/81	Baseline	.61	7.2	471	1.58	18.3
80-7264	1/14/81	Baseline	.59	6.3	460	1.66	18.8
80-7266	1/15/81	Baseline	.58	5.7	452	1.80	19.2
80-7268	1/16/81	Baseline	.58	5.9	460	1.92	18.8
80-7271	2/3/81	Baseline	.56	4.6	455	1.71	19.1
80-7273	2/4/81	Baseline	.64	7.8	462	1.71	18.6
80-7744	2/12/81	Baseline*	.41	2.3	456	2.22	19.2
80-7750	2/20/81	Moleculetor	.68	7.8	448	1.97	19.2
80-7752	2/24/81	Moleculetor	.58	5.2	443	2.01	19.6
80-7754	2/25/81	Moleculetor	.60	6.0	447	2.15	19.3
80-7756	3/3/81	Moleculetor	.60	6.3	435	1.98	19.8
80-7978	3/4/81	Moleculetor	.61	6.8	441	1.99	19.6

*Test voided - results not averaged into summary.

HFET Results - Emission values are expressed in grams per mile.

Test Number	Date	Test Condition	HC	CO	CO_2	NOx	MPG
80-7263	1/13/81	Baseline	.12	.03	370	1.45	23.9
80-7265	1/14/81	Baseline	.13	.09	371	1.51	23.9
80-7267	1/15/81	Baseline	.13	.04	363	1.50	24.4
80-7270	1/16/81	Baseline	.13	.06	367	1.56	24.1
80-7272	2/3/81	Baseline	.14	.03	356	1.47	24.9
80-7283	2/4/81	Baseline	.13	.09	371	1.49	23.9
80-7745	2/12/81	Baseline*	.14	.01	358	1.73	24.7

80-7751	2/20/81	Moleculetor	.15	.06	356	1.53	24.9
80-7753	2/24/81	Moleculetor	.15	.03	348	1.57	25.4
80-7755	2/25/81	Moleculetor	.15	.01	345	1.65	25.7
80-7757	3/3/81	Moleculetor	.15	.02	345	1.61	25.7
80-7979	3/4/81	Moleculetor	.14	.02	345	1.49	25.7

*Test voided - results are not averaged into summary.

Moleculetor Fuel Energizer Evaluation
1980 Ford Fairmont (Disqualified)

FTP Results - Emission values are expressed in grams per mile.

Test Number	Date	Test Condition	HC	CO	CO_2	NOx	MPG
80-6798	11/18/80	Baseline	.46	4.9	555	.49	15.7
80-6799	11/19/80	Baseline	.49	5.6	563	.51	15.5
80-6801	12/2/80	Moleculetor	.71	8.2	523	1.51	16.5
80-6803	12/3/80	Moleculetor	.71	3.9	456	1.51	19.1
80-6954	12/4/80	Moleculetor	.67	4.7	448	1.37	19.4
80-7254	1/13/81	Moleculetor	.65	6.3	458	1.08	18.9
80-7256	1/14/81	w/o Moleculetor	.62	5.1	452	1.06	19.2
80-7258	1/20/81	w/o Moleculetor	.68	5.7	456	1.19	19.0
80-7260	1/29/81	w/o Moleculetor	.65	5.1	470	1.14	18.5
80-7610	2/3/81	w/o Moleculetor	.65	5.2	470	1.21	18.5
80-7611	3/3/81	w/o Moleculetor	.62	4.8	414	1.14	20.9

HFET Results - Emission values are expressed in grams per mile.

Test Number	Date	Test Condition	HC	CO	CO_2	NOx	MPG
80-6797	11/18/80	Baseline	.05	.50	465	.46	19.0
80-6800	11/19/80	Baseline	.06	.60	469	.47	18.9
80-6802	12/2/80	Moleculetor	.14	.19	397	.95	22.3
80-6804	12/3/80	Moleculetor	.17	.05	367	1.19	24.1
80-6953	12/4/80	Moleculetor	.15	.13	363	1.02	24.4
80-7255	1/13/81	Moleculetor	.12	.22	371	.78	23.9
80-7257	1/14/81	w/o Moleculetor	.14	.22	364	.93	24.3
80-7259	1/20/81	w/o Moleculetor	.14	.16	364	.91	24.3
80-7261	1/29/81	w/o Moleculetor	.14	.16	370	.80	23.9
80-7609	2/3/81	w/o Moleculetor	.16	.20	363	.93	24.4
80-7612	3/3/81	w/o Moleculetor	.14	.17	335	.98	26.4